

Iron Spring Quarry

150 feet west of Grand Loop Road

20 miles east of U.S. Highway 287

Madison Junction Vicinity

Yellowstone National Park

Teton County

Wyoming

HAER No. WY-82

HAER  
WYO  
20-MADJUV  
1-

PHOTOGRAPHS  
HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
Rocky Mountain Regional Office  
National Park Service  
P.O. Box 25287  
Denver, Colorado 80225-0287

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Location: 150 feet west of Grand Loop Road, 20 miles east of U.S. Highway 287, Madison Junction Vicinity, Yellowstone National Park, Teton County, Wyoming

USGS Madison Junction Quadrangle, Universal Transverse Mercator  
Coordinates: 12.518280.4945030

Dates of Use: Intermittently during the first half of the twentieth century

Present Owner: National Park Service  
Mammoth Hot Springs, P.O. Box 168  
Yellowstone National Park, Wyoming 82190

Present Use: Abandoned

Significance: The Iron Spring Quarry served as a source of rock and gravel for road construction and maintenance projects in Yellowstone National Park. Due to the feature's mundane nature, the historic record contains little information about the quarry. Nevertheless, its character and its location adjacent to the Grand Loop Road suggest that the site may have contributed material for use in rock retaining walls and embankments, and as riprap, subgrade, and aggregate for bituminous surfacing.

Historian: Mitzi Rossillon  
Renewable Technologies, Inc., March 1998.

## I. HISTORY

### A. INTRODUCTION

The Iron Spring Quarry is located on the west side of Yellowstone National Park about 5 miles northeast of Madison Junction (figure 1). More specifically, it is on the north edge of Secret Valley Creek, a tributary of the Gibbon River. Here, the river passes through Gibbon Canyon where rock outcrops and steep slopes rise sharply above the stream. The canyon is 6½ miles long, with the Iron Spring Quarry located about ¾ mile from the canyon's south end. Gibbon Falls, an 84-foot drop in the river and a favorite stopping point for tourists, is less than ½ mile south of the quarry.

The Iron Spring Quarry lies along Yellowstone National Park's Grand Loop Road as it passes through Gibbon Canyon, and its use is tied directly to construction and possibly maintenance of that road. Unfortunately, the quarry has been very rarely documented in historic sources. A review of the history of the Grand Loop Road, however, suggests various uses for the quarry material. That history also leads one to believe that the quarry could have been used any number of times from the late nineteenth century into the mid-twentieth century.

### B. OVERVIEW OF CONSTRUCTION ACTIVITIES ON THE GRAND LOOP ROAD

The Grand Loop was the first permanent road to be built in the park. A primitive road, the belt line—as it was then called—provided a link between "the six great centers of attraction in the Park: Mammoth Hot Springs, Norris Geyser Basin, the Firehole Geyser Basins, Yellowstone Lake, the Grand Canyon of the Yellowstone, and the country around Tower Falls."<sup>1</sup> In 1878, the section from Mammoth Hot Springs (at the north entrance to the park) to the Lower Geyser Basin (about 40 miles to the south) was constructed. The early route passed through Gibbon Canyon, although about ¼ mile east of Iron Spring.<sup>2</sup> In the year following initial construction, workers returned to Gibbon Canyon to improve the grade, beginning a pattern of minor but frequent road repairs and improvements in the canyon that was to continue for decades.<sup>3</sup>

Early road construction in the park in large part focused on grading. No surfacing was applied, drainage was not a consideration, and bridges were generally short, wooden structures of one or two spans.<sup>4</sup> Beginning in the 1890s and into the first decade of the 1900s, road construction and maintenance became more sophisticated. Surfacing of broken rock or gravel covered most of the Grand Loop Road, and major bridges were of steel and concrete.<sup>5</sup> Rock retaining walls began to be used more frequently, and at Gibbon Canyon in particular, retaining walls were erected in 1890, presumably to improve the road's irregular grade. Road reconstruction in the vicinity of Gibbon Falls in 1902 included a "new heavy retaining wall ... about a half mile below [the falls]."<sup>6</sup>

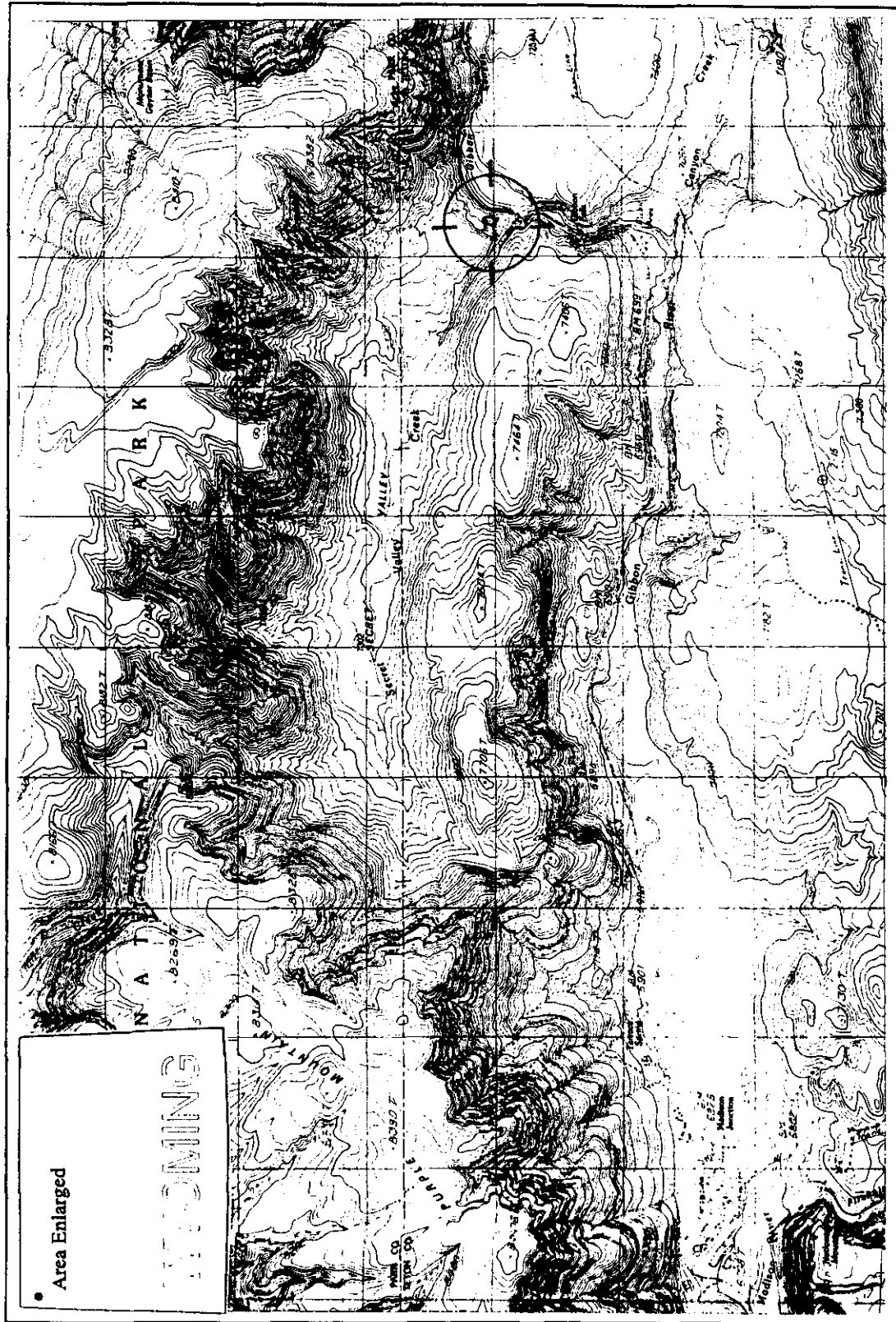


Figure 1. Location map for the Iron Spring Quarry, scale 1:48,000.

Regular repairs along the Grand Loop Road in Gibbon Canyon included 1907 repairs to dry-laid retaining walls near the falls, and re-building of other dry-laid walls at unspecified locations in the canyon in 1911 and 1914.<sup>7</sup> The most significant and long-lived improvements to the road date to the late 1920s and 1930s, however. After the National Park Service and the Bureau of Public Roads (predecessor of the Federal Highway Administration) joined forces in 1926 to build roads within the national park system, standards for road design quickly were developed and implemented. At about the same time, more attention began to be paid to road surfacing. Surfacing both extended the life of a road and made traveling more comfortable for park visitors.<sup>8</sup> Where previously workers at Yellowstone National Park used heating oil to reduce dust,<sup>9</sup> the 1930s saw the beginning of the use of asphaltic oil as an ingredient in surfacing material.

After the major road construction projects of the 1930s, work on the Grand Loop Road for the next few decades focused on maintenance. Only recently have the National Park Service and Federal Highway Administration embarked on a new, significant program of road reconstruction in Yellowstone.

### C. KNOWN USES OF THE IRON SPRING QUARRY

The sources of quarry rock, road fill, or surfacing material are infrequently identified in reports of road construction in Yellowstone National Park. This is especially true for the first 30 or more years of work, when reports of even the construction itself are brief. By the 1920s and 1930s, when regular appropriations were made for road projects and the Bureau of Public Roads became involved in the work, many aspects of road construction began to be reported in detail.

Given the early reporting limitations, perhaps it is no coincidence that the only positively documented use of the Iron Spring Quarry dates to 1931, the year in which the Grand Loop Road through Gibbon Canyon was given its first "permanent" surface. Earlier uses of the quarry are suggested by a few sources, however. Retaining wall construction at the turn of the century and road grading in 1928 may have involved the quarry as a source of materials.

One secondary source has suggested that the Iron Spring Quarry was used as early as 1902. This suggestion is based on a historical reference to use of a quarry somewhere in the vicinity of Gibbon Falls. In addition, recent observations at the Iron Spring Quarry have identified a small number of tin cans dating to that approximate time.<sup>10</sup> The historical reference does not pin-point the 1902 quarry location, however; it may just as well refer to a rock source at another location.

...rock was hauled on sleds for about a mile to be used in the construction of the new heavy retaining wall on the newly constructed section of road about a half mile below Gibbon Falls.<sup>11</sup>

By contrast, it is very possible that the Iron Spring Quarry was used in 1928 during reconstruction of the Grand Loop Road through Gibbon Canyon. A proposed 14-mile project which included Gibbon Canyon was the first that the Bureau of Public Roads investigated in Yellowstone National Park after it and the National Park Service agreed to work together on road design and construction. Construction of a 5-mile portion of that project started in 1928 when the Morrison-Knudsen Company received a grading contract with the Bureau. The project began south of Gibbon Falls and proceeded north into the canyon. While the Iron Spring Quarry was not specifically mentioned in available accounts, there were a few construction activities which could have made use of the quarry. First, in addition to grading, the contractor constructed rubble masonry headwalls at culverts, and laid rock embankment and riprap. Although an authoritative source reported that the rock quarried for the headwalls was at some distance from the project,<sup>12</sup> requirements for riprap probably were not as stringent, and that material could have been obtained locally. Second, Morrison-Knudsen opened an unspecified number of borrow pits to obtain suitable subgrade material, used to replace saturated soils in low-lying areas. Although the Iron Spring Quarry was not mentioned by name, it could have been a source of subgrade material, being located only about ¼ mile downstream from a "mucky" area.<sup>13</sup>

One ambiguous reference may support the contention that the Iron Spring Quarry was used in 1928. Three years later, Iron Spring was identified as "the old quarry." This was in the same context as the "old M.K. camp," a camp established by Morrison-Knudsen only three years earlier (see below).<sup>14</sup>

Data concerning use of the Iron Spring Quarry as a source of road material in 1931 is considerably more definitive. In that year, C.V. Hallenbeck received a contract to surface about 25 miles of the Grand Loop Road from Obsidian Cliff south past Madison Junction to Firehole Falls. The surface was to be 6 inches of crushed rock "and oil processing."<sup>15</sup> Work also was to include construction of "masonry retaining walls at Gibbon Falls."<sup>16</sup>

Among the material sources that Hallenbeck used was the Iron Spring Quarry. A contemporary photograph illustrates a rock-crushing plant at the mouth of Secret Valley, just 600 feet south of the quarry.<sup>17</sup> The proximity of the quarry to the crushing plant is strong evidence for use of the site at that time. Also, the site is apparently documented in the report of a landscape architect who visited Hallenbeck's operation in mid-May 1931.

Mr. Capes, Baker and I went to Gibbon Canyon where we met Mr. Hallenbeck, the successful bidder on the oiling job. Site was selected for his camp at the old M.K. camp at the foot of Gibbon Falls grade. Quarry site was selected at the old quarry, north of the Falls. Surfacing material pit, as selected by the B.P.R., was satisfactory and access roads were located for the contractor.<sup>18</sup>

Although the Iron Spring Quarry may have been used again after 1931, there is no available historical evidence. Additional improvements to the surface of Grand Loop Road were made in 1935 (which may or may not have included Gibbon Canyon) and 1948-1949.<sup>19</sup> The aggregate sources used on those two projects conceivably could have included pits opened by previous contractors.

## II. PHYSICAL DESCRIPTION

The Iron Spring Quarry is a large shallow pit situated on a high bench about 60 feet in elevation above the confluence of Secret Valley Creek and the Gibbon River. It is irregular in shape, although generally oval, and measures about 200 x 400 feet. The edges of the quarry are mostly short and moderately sloping (HAER photographs WY-82-1 and 2). The sidewalls are 5-6 feet high on the north and northeast edges of the pit. At one point along the east edge, the cut is as deep as about 12 feet (HAER photograph WY-82-3). The higher sidewall coincides with a small rock outcrop at that point. The floor of the pit is uneven, and includes a few areas where rock has been piled, a small bench was left unexcavated, and excavation went slightly deeper than elsewhere.

The predominance of gravels and finer sediments on the pit floor and most sidewalls indicates that the quarry served primarily as a source of gravel or small rock which would have been suitable for surfacing material (HAER photograph WY-82-4). In addition, two small concentrations of pea gravel—one near the center of the pit and the other along the southwest edge—suggest that a screening plant once stood at the Iron Spring Quarry (see below).

While the overall character of the pit suggests that it was predominantly used as a source of aggregate, the presence of distinctive piles of rock and stone-working tools attest to the quarry's function as a source for building stone, also. Because rhyolite is a relatively soft rock, it does not exhibit tool marks. Instead, evidence of stone-working on the rock itself is limited to sharp, broken edges, as compared with the rounded shapes of apparently unworked, eroded rhyolite.

Rhyolite boulders have been piled into about four groupings at the quarry, mostly in the southeast quadrant of the pit (HAER photograph WY-82-5). The piles cover areas which vary in size from less than 150 to almost 1,500 square feet. The most interesting of these is one near the south center of the pit adjacent to a haul road which enters the pit from the south. At this location, there is clear evidence of rock-breaking. Adjacent to a large, elongated pile of rounded and apparently unworked rhyolite boulders is a smaller group of rock with broken, angular edges (HAER photograph WY-82-6). The latter pile covers about 350 square feet, and consists mostly of rocks ranging in size from 6 inches to 3 feet in maximum dimension. The sizes suggest that rocks were rough-squared and dressed in this area of the quarry.

In addition to the larger piles of rhyolite, there are two smaller groups of fist-sized and smaller rock. The first is along the sloping edge and bottom of the pit at its southwest edge, and it covers less than 300 square feet. The rocks there range in size from about 1½ to 4½ inches in maximum dimension (HAER photograph WY-82-7). They appear from their small sizes to be the waste from the final stage of stone-working. A second pile of small rock was observed about 185 feet to the north, on the floor of the pit and at the edge of the unexcavated bench. It covers only about 80 square feet.

Several tools presumably associated with the quarry's operation were abandoned at the site. These include chisels, shovel blades, rock drill bits, hammer heads, short pieces of twisted wire cable, and vehicle and machinery parts. The chisels, apparently used to work the rock, are a testimony to both the relative softness of rhyolite and the adaptation of tools to local conditions. The chisels are not standard stone-working tools.<sup>20</sup> Instead, they apparently are spikes—possibly bridge spikes—converted to a non-traditional use. They are made of ¾-inch steel rod and vary in length between 13 and 22 inches. At the distal end of each chisel is a pyramidal point, in some cases flattened from use. The opposite end generally is battered.

In addition to the tools, several other items have been discarded at the quarry. These include small collections of household trash and some building material. There are also the collapsed and scattered remains of at least three wood-frame buildings (HAER photograph WY-82-8). Most of these items date to the 1930s.

Access to the Iron Spring Quarry from the Grand Loop Road was via a system of narrow work roads. The main access road apparently exited from the Grand Loop Road less than 200 feet northeast of Secret Valley Creek. It then gradually climbed the south edge of the bench on which the quarry is located (HAER photograph WY-82-9). As it reached the top of the bench, the 7-foot-wide road split into two branches, one approaching the south side of the pit and the other heading toward the west side. Other roads criss-crossed the ground just south of the pit.

Reconciling the historical record with the physical resource is somewhat problematic at the Iron Spring Quarry. While the site's name indicates its principal use as a rock quarry, its shape and other physical characteristics suggest that the pit was a source of gravel and small rock as well as building stone. Hallenbeck's crusher set-up adjacent to Iron Spring almost certainly indicates that the quarry was the source of rock that was crushed and used for surfacing in 1931. Because Hallenbeck also was assigned the task of constructing a masonry wall at Gibbon Falls, however, it is possible that some of the rock for the wall originated at Iron Spring (HAER photograph WY-82-10). In addition, if Morrison-Knudsen actually used the quarry in 1928 as is suspected, then the pit may have been a source of subgrade material to replace mucky soil, as well as rock for embankment and riprap. Finally, there is some physical evidence that the Iron Spring Quarry was used at a later date by a road maintenance crew as a gravel pit and dumping area. Two small areas of pea gravel (obviously having passed through a screen) and a small

patch of asphalt (presumably plant mix) were observed at the pit. Because early 1930s road surfacing at Yellowstone did not employ plant mix asphalt, the remains post-date the last major construction during the historic period. The plant mix is probably evidence of dumping of excess material because there is no physical indication that a hot-mix plant was actually set up at the quarry. The gravel might remain from one or more routine maintenance operations, such as patching, sanding, or chip-seal surfacing.<sup>21</sup>

### III. FUTURE OF THE PROPERTY

The National Park Service and the Federal Highway Administration intend to reconstruct the Grand Loop Road through Gibbon Canyon. The route of the road in the vicinity of Iron Spring will be removed, and a new road segment constructed on the east side of Gibbon Canyon. The Iron Spring Quarry will be filled, using some of the excess material from this project.

### IV. NOTES

1. Hiram Martin Chittenden, *The Yellowstone National Park* (Cincinnati: Stewart & Kidd Company, 1918), 238.
2. Mary Shivers Culpin, *The History of the Construction of the Road System in Yellowstone National Park, 1872-1966, Historic Resource Study, Volume I*, Selections from the Division of Cultural Resources, Rocky Mountain Region, no. 5 (Denver: National Park Service, 1994), 183-84; appended 1878 map in back pocket.
3. Culpin, *Road System in Yellowstone National Park*, 184; Chittenden, *Yellowstone National Park*, 241. See Culpin pp. 186-87 for improvements made in 1883 and 1890.
4. See, for example, Culpin, *Road System in Yellowstone National Park*, 187.
5. Chittenden, *Yellowstone National Park*, 242.
6. Culpin, *Road System in Yellowstone National Park*, 187-188.
7. *Ibid.*, 189-191.
8. *Ibid.*, 130; L.I. Hewes, "America's Park Highways," *Civil Engineering* 2, no. 9 (September 1932): 539.
9. Culpin, *Road System in Yellowstone National Park*, 135-136.
10. Stanley M. Parks and Stacy Stupka-Burda, *National Register Testing and Site Evaluation along the Madison-to-Norris Segment of the Grand Loop Road, Yellowstone National Park, Wyoming*,

Rocky Mountain Region Archeological Project Report (Lincoln, Nebraska: National Park Service, 1996), 29, 33.

11. Culpin, *Road System in Yellowstone National Park*, 188, after Hiram Chittenden, *Annual Report upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Road from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming and Erection of Monument to Sergeant Charles Floyd in the Charge of Hiram Chittenden, Captain, Corps of Engineers* (Washington, D.C.: Government Printing Office, 1901), 3780.

12. G.W. Hoffman, "Final Construction Report, Gibbon Canyon Section 1-B, Norris Junction-Madison Junction Road, Yellowstone National Park, Wyoming, 1928," 7, on file, Federal Highway Administration, Lakewood, Colorado.

13. Ibid., 1-4, 7, 11-12. The site nearest the Iron Spring Quarry that required replacement subgrade material was between Stations 288 and 292 (p. 12). The quarry would have been at about Station 274.

14. K. McCarter and H. Baker, *Report to the Chief LA through the Supt. of YNP*, 1931, quoted in Culpin, Marcy, to Ann Johnson and others, 21 April 1995, electronic mail.

15. "Park to Build Much Highway," *Bozeman Daily Chronicle*, 30 May 1931, p. 8; "West Yellowstone," 31 May 1931, p. 2. In the early 1930s, there were two basic types of asphaltic-oil road being constructed: H.G. Nevitt, "Rational Design of Asphaltic-Oil Roads," *Engineering News-Record* 104, no. 17 (24 April 1930): 686.

Oil treatment of roads has differentiated into the surface-treatment method and the surface-mixing [road mix] methods. In surface treatment, oil is applied to an existing compacted road surface, penetrates the upper portion of the road and acts as a binder. A cover material, such as stone chips or sand, is applied to prevent the oil from picking up under traffic. In the surfacing-mixing process the predetermined quantity of oil is actually incorporated with the road metal to give the desired thickness of oiled mat, and the loose metal is bladed or worked until a thorough mixture has taken place, with uniform distribution of oil throughout the aggregate. The mixed material is then distributed to grade and allowed to compact under traffic.

Available historic references do not specify which of the two methods Hallenbeck employed at Yellowstone in 1931. Both generally required crushed rock for aggregate.

16. "Park to Build Much Highway."

17. Parks and Stupka-Burda, *National Register Testing and Site Evaluation*, 99.

18. McCarter and Baker, *Report to the Chief LA*.

19. Culpin, *Road System in Yellowstone National Park*, 196-197.

20. For descriptions and illustrations of standard hand cutting tools, see William S. Lowndes, *Building Stone* (Scranton, Pennsylvania: International Textbook Company, 1921), 34-37.

21. The contention that the quarry was used after 1931 is supported by the presence of a piece of dinnerware having a marker's mark dating to 1933: Parks and Stupka-Burda, *National Register Testing and Site Evaluation*, 34.

## V. BIBLIOGRAPHY

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